References

ALEKSIUK, M. 1964. Observations of birds and mammals in the Perry River Region, N.W.T. *Can. Field Nat.* in press.

ARMSTRONG, E. A. 1947. *Bird Display and Behaviour.* Lindsay Drummond, London.

BARRY, T. W. 1960. Breeding biology of the Atlantic Brant (*Branta bernicla hrota*). Unpub. M. Sc. thesis.

BARRY, T. W. 1962. Effects of late seasons on Atlantic Brant reproduction. *Jour. Wildlife Mgt.* 26: 19-26.

BARRY, T. W. and J. EISENHART. 1958. Ross' Geese nesting at Southampton Island, N.W.T. *Auk* 75: 89-90.

COOCH, F. G. 1954. Ross' Goose in the Eastern Arctic. *Condor* 56: 307.

DELACOUR, J. 1954. *The Waterfowl of the World.* vol. I. Country Life, London. 284 pp.

GAVIN, A. 1945. Notes on mammals observed in the Perry River District, Queen Maud Sea. *Jour. Mamm.* 26: 226-330.

HEARNE, S. 1795. *Journey to the Northern Ocean.* New Ed., J. B. Tyrrel, editor. The Champlain Society, 1911.

HANSON, H. C., P. QUENEAU and P. SCOTT. 1956. *The Geography, Birds, and Mammals of the Perry River Region.* Arctic Institute of North America. Sp. Pub. No. 3. 96 pp.

LINCOLN, F. C. 1939. *The Migration of American Birds.* Doubleday, Doran, New York. 189 pp.

MACINNES, C. D. 1964. The status of Ross's Goose in 1962-63. *Wildfowl Trust 15th Ann. Report*: 137-139.

MACINNES, C. D. and J. S. WESKE. 1962. (July and August.) A Reconnaissance of Goose Banding Opportunities in the Perry River Area of the Central Arctic. Unpub. report. Canadian Wildlife Service.

MACINNES, C. D. and F. G. COOCH. 1963. Additional eastern records of Ross' Goose (*Anser rossi*). *Auk* 80: 77-79.

VAN TYNE, J. and A. J. BERGER. 1961. *Fundamentals of Ornithology.* John Wiley and Sons, Inc., New York. 624 pp.

The status of Ross's Goose in 1962-63

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Summary

In 1962-63 there were at least 25,000 Ross's Geese in California. Earlier estimates, of as few as 2,000 in 1949, were probably too low because too little was known about the distribution of Ross's Geese in California and of their mixing with Snow Geese. Attempts to estimate the population size by the mark and recapture technique, utilising 161 geese colour-marked in the Perry River breeding area in the summer of 1962 and a further 292 marked in Saskatchewan later that year, proved unsatisfactory. Some neck-bands had been lost and no red-dyed geese could be detected, but the main cause of failure was the low ratio of marked to unmarked geese.

During the summer of 1962, John S. Weske and I spent six weeks in the Perry River region of northern Canada (see Hanson, Queneau & Scott, 1956) trying to band moulting geese. I was primarily interested in the Canada Geese (*Branta canadensis*), as this was to be the last of four summers' work on this species. However, our chief sponsors, the Canadian Wildlife Service, requested that, in addition, we band as many species of geese as possible, including the Ross's Goose (*Anser rossii* Cassin).

As a part of my Canada Goose study I had attempted to adapt the well-known mark and recapture technique of population inventory for use on goose flocks. Because geese are so difficult to catch in large numbers during the winter, it appeared logical to substitute sight records for actual recaptures. Conspicuous plastic neck-bands with trailing streamers (Craighead and Stockstad, 1956) proved very satisfactory for this purpose. The principal difficulty encountered in the Canada Goose study was the large overall size of the population. Even though nearly 2,000 marked birds were present in the fall of 1961, the frequency of marks was less than six per thousand geese sampled. (Detailed results of the Canada Goose study will be presented elsewhere.) Ross's Goose seemed to offer a perfect opportunity to overcome this difficulty. Since the most liberal estimates available indicated that the population did not contain more than 20,000 birds, a total of only 150 colour-marked

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birds would give a more favourable marked: unmarked ratio.

In order to test my technique, therefore, Weske and I put green neckbands on all the Ross's Geese large enough to retain them. We were able to mark a total of 161 birds. Later in the fall, Mr. Alexander Dzubin of the Canadian Wildlife Service marked an additional 292 Ross's Geese, 138 with purple neckbands, 67 with red dye and 87 with yellow dye. Thus the stage seemed set for a most successful counting experiment and accordingly I set out for California in mid-February 1963. For a week I scanned flocks of Ross's Geese, first near the Merced National Wildlife Refuge in the San Joaquin Valley, and then in the rice farming lands of Butte County in the Sacramento Valley. At the end of the week I was forced to admit that my experiment was a dismal failure. The reason for failure, while unexpected, was a happy one; there were too many Ross's Geese!

In the Merced area, under the expert guidance of Mr. R. G. LeDonne of the California Department of Fish and Game, I examined critically over 1,000 Ross's Geese under very good viewing conditions, and yet found only six marked birds. In the Sacramento Valley, Mr. William Anderson and I were able to examine Ross's Geese flying less than 100 feet overhead, mixed with huge flights of Snow Geese (*Anser c. coerulescens* (L.)). In two days we counted 707 Ross's Geese, but only four were neck banded. (The dyed birds were coloured chiefly on the back, and so were not readily distinguishable when flying overhead.) It is quite evident that these samples are too small to allow calculation of a reliable population estimate.

It seems likely that part of the lack of marked birds may be explained on the basis either of loss of the marking device, or of selective mortality of neck-banded birds. I now have evidence that neck-banded Canada Geese suffer higher mortality than do birds which are marked only with standard leg bands. Although I saw at least four of Mr. Dzubin's yellow-dyed birds, no red Ross's Geese were reported at any time during the winter. Mr. Dzubin has confirmed that the red dye washes off.

However, the unexpected increase in the Ross's Goose population cannot be ascribed entirely to missing marks. Two other independent counts of the Ross's Goose population were available for the winter 1962-63. Mr. Dzubin made age ratio counts of the birds near Kindersley, Saskatchewan and estimated a population of 30,000-35,000, based upon the previous winter inventory figure of 20,000. The United States Fish and Wildlife Service official inventory for the winter of 1962-63 was 25,250. This count was made by two airborne observers the very week that I was counting the birds on the ground.

While 25,000 geese do not constitute a large population by any means, this figure represents a dramatic increase over the 'declining' population of 2,000 geese counted in 1949 (Hanson *et al.*, 1956). With knowledge of the breeding success of the species still fragmentary, it is difficult to find a precise reason for the growth of the population. Perhaps, however, the answer does not lie entirely on the breeding ground. In answer to my question 'What caused the increase?', Mr. Frank M. Kozlik of the California Department of Fish and Game ventured the following opinion: 'I believe that the "increases" in populations have resulted from more effort being expended studying these birds. At one time it was believed that these geese wintered only on the Sacramento Refuge. Later, this was expanded to include the Sacramento Valley. Now we know that the San Joaquin Valley is equally important.' The consequences of this new knowledge may be appreciated if we examine the basis of the 1949 estimate. ' "Decidedly smaller numbers of the Ross' goose were seen on the Sacramento National Wildlife Refuge, California, during December 1940, as compared with those of the preceding year . . ." On 5 November 1949 U.S. Fish and Wildlife Service observers checked the Ross' Goose population at Tule Lake, California, and accounted for about 2,000 birds along with almost 100,000 Lesser Snow Geese.' (Reports cited in Hanson, Queneau and Scott, 1956.) Bill Anderson told me that few people, even in California, believed it possible to identify scattered Ross's Geese among the hundreds of thousands of Snow Geese which winter in the Sacramento and San Joaquin Valleys. Thus attention was focused on those Ross's which held aloof from the Snow Geese. Yet, when we two examined a group of 60,000 Snows in Butte County (Sacramento Valley), we found at least one or two Ross's for each hundred Snows, mixed and scattered throughout the flock. Small wonder, then, that many Ross's Geese have been over-looked in the past.

I do not concur with the opinion expressed by Hanson, Queneau and Scott that census of the Ross's Goose population may be accomplished more easily on the breeding grounds. Aerial surveys by the Canadian Wildlife Service in 1960, and by a U.S. Fish and Wildlife Service aircraft with the author aboard in 1962 failed to reveal any substantial increase in the number of Ross's Geese inhabiting the Perry River region compared with the 1949 survey of Hanson,

Queneau and Scott. Furthermore, the discovery that Ross's Geese nest at the edges of Snow Goose colonies in the eastern Arctic (MacInnes and Cooch, 1963) leads me to believe that the breeding grounds of the California populations may not be restricted entirely to the coast of the Queen Maud Gulf.

The future for Ross's Goose appears bright. Concentrated study of the breeding ecology of the species has been undertaken by the Canadian Wildlife Service. New refuges are being established in California under both state and federal programmes. Hunting of Ross's Geese was made legal in 1963, but this should make little difference to the annual kill. In the past, a few hundred Ross's Geese were shot each year by hunters who mistook them for the more abundant and much sought after Snow Geese. The new regulation makes it legal for the hunter to take his kill home instead of throwing it in the rushes, or surrendering it to a game warden.

Support for this project was provided by the Canadian Wildlife Service, by the Chapman Memorial Fund of the American Museum of Natural History, and by the Department of Conservation, Cornell University. Many people rendered invaluable assistance; I wish in particular to thank Messrs. T. W. Barry and A. Dzubin of the Canadian Wildlife Service, Messrs. F. M. Kozlik, R. G. LeDonne and Wm. Anderson of the California Department of Fish and Game, and Messrs. J. E. Chattin and Ray Glahn of the U.S. Fish and Wildlife Service. Dr. O. H. Hewitt of Cornell offered many helpful suggestions during the course of the work.

References

CRAIGHEAD, J. J. and D. S. STOCKSTAD. 1956. A coloured neckband for marking birds. *J. Wildlife Mgmt.* 20: 331-332.

HANSON, H. C., P. QUENEAU and P. SCOTT. 1956. *The geography, birds and mammals of the Perry River region.* Arctic Inst. N. Amer., Spec. Pub. no. 3, 96 pp.

MACINNES, C. D. and F. G. COOCH. 1963. Additional eastern records of Ross' Goose (*Chen rossii*). *Auk* 80: 77-79.

The Ontario Waterfowl Research Foundation

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The Province of Ontario occupies an area of 1,070,000 sq. km. in Eastern Canada, and includes 107,000 sq. km. of inland fresh water and 97,000 sq. km. of the Great Lakes. Life zones range from Upper Austral in the south to Arctic along the Hudson Bay Coast. More than forty species of waterfowl occur naturally in Ontario. Forest-inhabiting species, such as Black Duck (*Anas rubripes* Brewster), Canada Goose (*Branta canadensis interior* Todd) and Wood Duck (*Aix sponsa* (L.)) are among the most important. In view of the tremendous potential for waterfowl management in this Province, a group of interested sportsmen and wildlife biologists formed the Ontario Waterfowl Research Foundation in 1961. The Foundation's aim is improved waterfowl management in Ontario. It seeks to achieve this by supporting basic research in waterfowl biology, training students as biologists and managers, and distributing results of research for application.

Administration

The affairs of the Ontario Waterfowl Research Foundation are governed by a Board of Trustees and Honorary Trustees. It is advised on scientific matters by a Scientific Advisory Board, made up of representatives of the Canadian Wildlife Service, two Branches of the Ontario Department of Lands and Forests, and Ontario's universities. There is an Executive Director.

Through board members and advisers, the Ontario Waterfowl Research Foundation maintains contact with the North American Wildlife Foundation, Delta Waterfowl Research Station, Ducks Unlimited (Canada), Canadian Wildlife Federation, government agencies and other international, national and provincial groups sharing mutual interests in waterfowl.

Niska Waterfowl Research Station

In recognition of the fact that much waterfowl research requires the use of captive